Weston Fiala
EEP 524 A
HW 4

Operational Intensity of convolution kernel.
FilterSize = F;
Pixels = N;

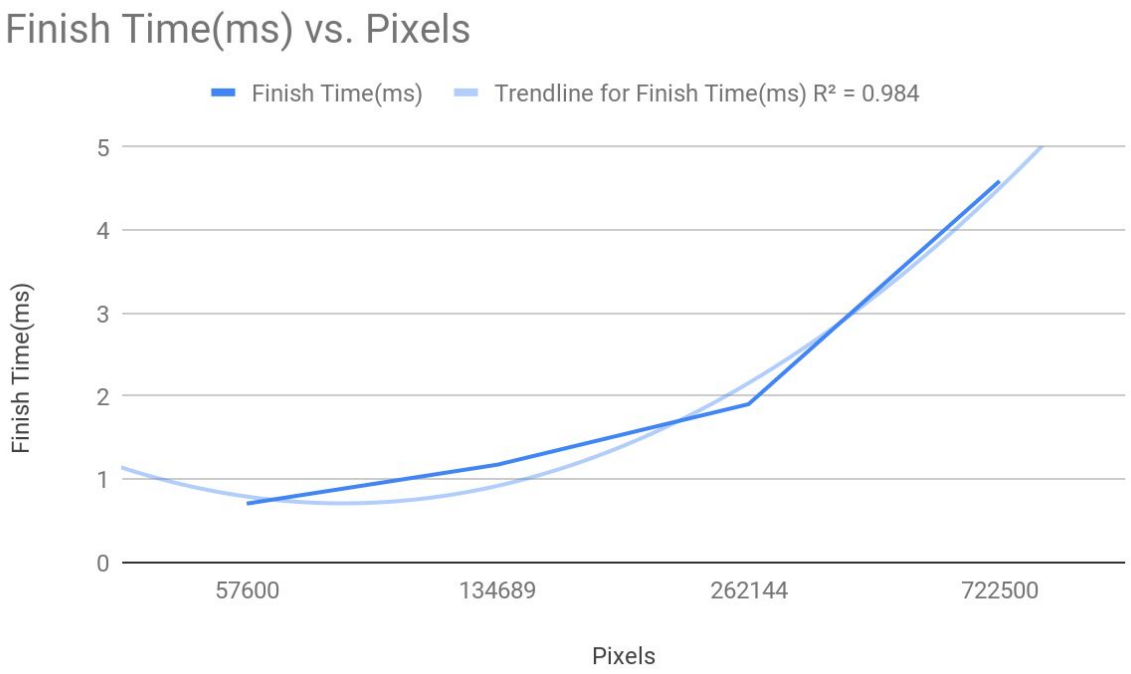
Read Memory: F^2*N (read input pixels) + F^2 (filter) + 1 (filter width) + 1 (sampler)
Write Memory: N (write output pixel)
Total Memory: 4(sizeof float and int) * ((F^2 + 1) N + (F^2 + 2))

Computation: F^2*N (filter * pixel) + F^2 (sum)

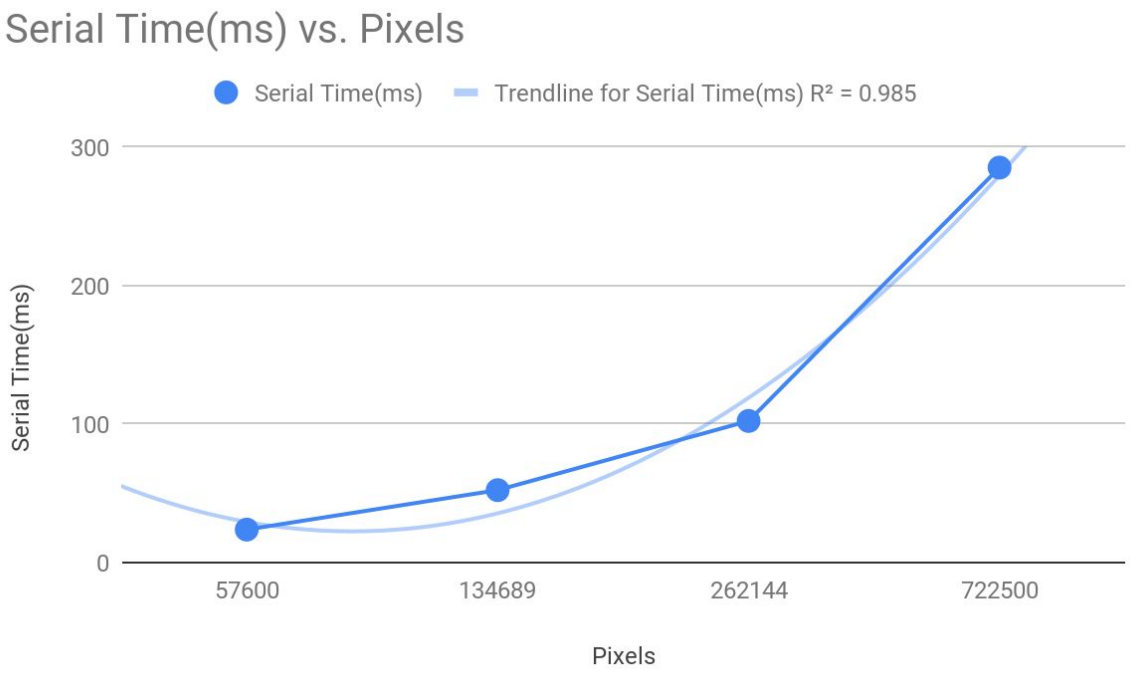
Algorithmic Intensity: = (F^2*N + F^2) / 4*((F^2 + 1) N + (F^2 + 2)) =~ ¼

The OpI for this kernel is low, and is going to memory bandwidth limited. There is just not enough computation per pixel read to increase the throughput of this kernel.

Number of Pixels vs Average Finish Time in milliseconds



Number of Pixels vs Average Serial Finish Time in milliseconds



It is possible to fit a curve to these data points. In the pictures above I have included a polynomial curve fit of second order. With only 4 points of data it may be hard to see the exact fit, but with more data I believe that you would be able to see a clear O(n^2) curve.

Lena 515x512 side by side comparison

Order: Original, 5x5 .75 sigma, 7x7 .75 sigma, 9x9 1.2 sigma